REMARKS

Claims 25-34 have been added. Claim 17 has been amended. Claims 1-3, 4-34 are pending. Applicants reserve the right to pursue the original and other claims in this and in other applications.

Claim 17 stands rejected under 35 U.S.C. § 112, second paragraph, as being indefinite. Applicants respectfully traverse the rejection. Claim 17 has been amended to address the concerns raised in the Office Action. Accordingly, the rejection should be withdrawn.

Claims 1-2 and 4-24 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent No. 5,014,162 ("Clark"). Reconsideration is respectfully requested.

In a preferred embodiment, the printed circuit board 40 carrying an electronic component 10 is connected to a circuit pattern formed on a base substrate 1. A metal plate 4 is soldered upon a land 2 via a solder layer 5. The land 2 is formed with through-holes 6, the through-holes providing electrical interconnection to a rear side land, as explained in more detail in the specification, pages 20+. There are several advantages to having a plurality of through-holes in each land – greater bonding strength between the land and the base substrate, increased efficiency in heat dissipation at the time of spot welding a metal plate to the land, and prevention of scattering of molten solder alloy to the outside. The claimed invention should not be limited, however, to the preferred embodiments described and shown in the specification and drawings.

Claim 1 recites a printed circuit board having an external interconnection terminal, the external interconnection terminal having a "land formed on a front surface of [a] base substrate and a metal plate soldered upon [the] land via a solder layer, . . . [a] through-hole being filled with a solder such that [the] solder in [the] through-hole extends in continuation to [the] solder layer . . . said through-hole being provided in plural numbers in each land and said solder layer being formed over said plural numbers of through-holes."

Clark relates to solder assembly of components, such as the *soldering of flexible circuits 10 to printed circuit boards 14* and Figures 1-10 show these two components, which are bonded together. The printed circuit board 14 has pads 15 and a solder mask 16. The flexible circuit 10 has plurality of conductive paths 11, each terminating in a conductive pad area 12 having a hole 13. Each hole 13 is bonded to a corresponding conductive pad area 15 formed on a printed circuit board 14. The flexible circuit 10 includes cover layers 17, 18 on both of its surfaces.

The Office Action cites to the flexible circuit 10 as the base substrate, references 12 and 19 as the first and second lands, reference 15 as the metal plate, and to a solder deposit 30 as the solder layer. (Office Action, p.3). Applicants respectfully disagree with all of the above contentions. The flexible circuit 10 in Clark is <u>not</u> a base substrate of a printed circuit board, but rather is a *flexible circuit*. Further, Clark references 12 and 19 are shown as one "single" unit. On the other hand, in the claimed invention, the first land and the second land are <u>distinct</u> and are formed on a front surface and a rear surface, respectively, of a *base substrate*. In addition, Clark merely discloses that the solder deposit 30 melts and flows up through the plated-through holes 13 and covers the pads 12. (Clark, col. 5, lines 5+). Clark does <u>not</u> have a through-hole penetrating through a land and a base

substrate of a printed circuit board such that the through-hole is filled with solder continuously to the "solder layer." The Office Action contends that Clark teaches the formation of a solder layer when the cavities 21 are filled with a solder paste. (Office Action, p.5). Applicants respectfully disagree. Clark only discloses that a shuttle element 20 having an array of cavities 21 is filled with a solder paste and the shuttle element 20 is used in the soldering process. Neither the printed circuit board 14 nor the flexible circuit 10 in Clark has a through-hole filled with solder continuously to a "solder layer."

Furthermore, Clark does not disclose or teach a "solder layer" formed over a plurality of through-holes in each land. The Office Action concedes that Clark does not teach this limitation, but contends that such a feature is common knowledge. Applicants respectfully disagree. To support its contention, the Office Action relies on a 1977 decision of the Seventh Circuit. Applicants respectfully submit that the cited case is not binding law on the issue of nonobviousness. *See e.g.*, Examination Guidelines for Determining Obviousness Under 35 U.S.C. 103 in view of the Supreme Court Decision in *KSR*. For all of the above-mentioned reasons, Applicants respectfully submit that claim 1 should be allowable.

Claims 2 and 4-24 either depend from claim 1 or contain similar limitations as claim 1. Therefore, claims 2 and 4-24 should be allowable for at least the same reasons as claim 1.

Newly added claim 25 contains similar limitations as claim 1 but is different in scope to round out the protection afforded to the invention. For the same reasons as claim 1 and for other reasons, claim 25 and dependent claim 26 are allowable.

Newly added claim 27 does not have through-holes in a base substrate, but recites a land reinforced by a solder resist layer and a metal plate soldered upon the land via a solder layer. Because the claimed invention omits the through-holes, required in Clark, but achieves the function through the solder resist layer, claim 27 and dependent claim 28 are allowable over Clark.

Newly added claims 29-34 recite a printed circuit board having "through-holes [] disposed along" an inside or outside of a part of a shaped solder resist pattern. There are several advantages to having the through-holes in this manner – greater bonding strength between the land and the base substrate, increased efficiency in heat dissipation at the time of spot welding a metal plate to the land, prevention of scattering of molten solder alloy to the outside, and reduced pore formation between the land and the metal plate. For details, please refer to the specification, pages 27+; Figures 5-8. Clark does not disclose or teach all of the limitations of claims 29-34 and therefore, claims 29-34 are allowable.

In view of the above, Applicants believe the pending application is in condition for allowance.

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Respectfully submitted,

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